

3. On the Variation of the Sea-Elephants.

By Dr. EINAR LÖNNBERG, C.M.Z.S.

[Received February 25, 1910.]

(Text-figures 55 & 56.)

Four years ago, when I wrote about the Sea-Elephant of South Georgia*, the question arose in my mind whether the Sea-Elephants inhabiting the widely separated islands in the southern subantarctic seas all belonged to one and the same race. It appeared to me most probable that this was not the case, because the herds of the different islands are, and must have been for a very considerable time, completely isolated from each other, as these animals are not pelagic in their habits, but chiefly confined to the waters surrounding the islands on the shores of which they spend a great part of their lifetime. As, however, I had not sufficient material from different localities for comparison, and the literature did not contain enough to throw satisfactory light on the matter, I had to leave it unsolved. It was therefore a great satisfaction to me when my friend Mr. R. Lydekker took up this question last year and published a paper "On the Skull-Characters in the Southern Sea-Elephant."† Having read that paper, however, it appeared to me that the characters on which Lydekker has based the racial differences which, according to his views, exist between the Sea-Elephants belonging to four different geographic groups with subspecific value were rather unsatisfactory, when I considered the variation found in skulls of these animals which I had studied from material brought from South Georgia.

In the paper quoted Lydekker diagnosed the following races:—

"1. *Macrorhinus leoninus typicus*, Juan Fernandez."

"2. *M. l. falclandicus*, Falkland Islands."

"3. *M. l. macquariensis*, Macquarie and (?) Chatham Islands."

"4. *M. crozetensis*, Crozet and (?) Kerguelen and Heard Islands."

According to later information Lydekker presumes that the Sea-Elephant of Juan Fernandez belongs to the same geographic group as those known under the specific name *angustirostris*, which latter name then should "be regarded as a synonym of *leoninus*, while *falclandicus* would become the substantive name for the Southern species" (*l. c.* p. 606).

Lydekker bases the subspecific differences between the Sea-Elephants from the different islands on certain proportions and other characteristics of the skulls selected from the palatal surface. To prove the difference in proportions he quotes certain measurements in English inches from which the relations in

* K. Sv. Vetenskaps-Akad. Handl., Bd. xl.

† Proc. Zool. Soc. 1909, pt. iii. p. 600.

percentages of the basal length of the skull may be reckoned, as is done below.

| | Falkland. | Macquarie. | Crozet. | Chatham. |
|---------------------------|-------------|-------------|-------------|-------------|
| "Basal length"..... | 20 ins. | 18 ins. | 16.5 ins. | 16.3 ins. |
| | (= 500 mm.) | (= 450 mm.) | (= 412 mm.) | (= 407 mm.) |
| Maximum width in percent. | | | | |
| of basal length | 75 | 77.7 | 84.8 | 71.8 |
| Length of palate in ditto | 55 | 52.7 | 54.5 | 52.1 |
| Width of palate in ditto | 36.5 | 35 | 39.3 | 37.4 |

Some of these relations thus appear at first sight to be rather different in the different animals, but before any decision can be made it is of importance to find out how constant these percentages are when a somewhat greater number of skulls are measured and compared. To obtain knowledge about this I have measured seven skulls of adult and semiadult bulls of Sea-Elephants, all of them from South Georgia. The largest of these is 3 cm. longer than Lydekker's largest skull, and the smallest 0.7 cm. shorter than his smallest skull. The material might thus be regarded as comparable. The relative dimensions of the South Georgia skulls are recorded in the accompanying table of measurements. From this it is apparent that the zygomatic

| | ♂ | ♂ | ♂ | ♂ | ♂ | ♂ | ♂ | ♀ | Quite young. | | |
|---|------|------|------|------|------|------|------|------|--------------|------|------|
| | | | | | | | | | ♂ | ♂ | ♂ |
| Basal length of skull in mm | 530 | 500 | 484 | 470 | 450 | 442 | 400 | 293 | 197 | 196 | 193 |
| Zygomatic width in % of basal length | 79.8 | 74.0 | 68.3 | 74.8 | 77.7 | 71.9 | 73.0 | 72.3 | 80.7 | 81.1 | 84.9 |
| Length of palate " " " | 51.3 | 52.8 | 50.8 | 54.0 | 52.4 | 56.5 | 49.5 | 57.3 | 46.7 | 50.5 | 45.0 |
| Width " " " | 37.1 | 35.2 | 32.2 | 36.1 | 35.1 | 34.9 | 34.5 | 34.1 | 34.5 | 34.6 | 35.7 |
| Length of interpalatine suture in % of basal length | 5.6 | 16.5 | 11.7 | 13.1 | 9.7 | 13.8 | 14.5 | 13.9 | 5.6 | 10.2 | 10.6 |
| Length of premaxillaries on the palatine surface in % of basal length | 21.7 | 23.4 | 22.5 | 25.7 | 20.2 | 21.4 | 19.7 | 16.3 | ... | ... | ... |
| Width of occipital condyles in % of basal length | 23.0 | 24.0 | 25.6 | 25.7 | 27.1 | 27.6 | 29.2 | 31.4 | 40.6 | ... | ... |
| Width of skull at posterior edge of meatus audit. ext. in % of basal length | 68.4 | ... | 61.9 | 67.4 | 68.0 | 66.0 | 67.2 | 65.1 | ... | ... | ... |
| Width of skull on a level with the upper posterior premaxillary suture in % of basal length | 38.3 | 35.0 | 30.9 | 35.5 | 36.8 | 36.0 | 33.2 | 21.6 | 29.9 | 31.6 | 32.1 |
| Least frontal width of skull in % of basal length | 20.5 | 15.8 | 15.0 | 17.2 | 18.6 | 18.5 | 16.2 | 12.2 | ... | ... | ... |
| Length of nasals in mm..... | 95 | 95 | 66 | 56 | 79 | 57 | 62 | ... | ... | ... | ... |
| Combined width of both nasals in mm. | 70 | 67 | 56 | 62 | 62 | 42 | 49 | ... | ... | ... | ... |

width—as usual among large mammals—is subject to considerable variation, viz. from 68.3 to 79.8 per cent. of the basal length of the skull, but usually it is about 72–75 per cent. A comparison reveals, then, that with regard to this dimension three of Lydekker's specimens, representing "*M. l. falklandicus*" and "*M. l. macquariensis*," fall within the limits of variation for the Sea-Elephant of

South Georgia, but one of them, that regarded as the type of "*M. l. crosetensis*," is somewhat different, showing a percentage larger than that of any of the adult skulls from South Georgia. Although a direct comparison between this Crozet Island specimen measuring 412 mm. and the quite young skull from South Georgia measuring 193 mm. (conf. the table) cannot be made, though the former is young also, it is of interest to find that the percentage expressing the relation between basal length and zygomatic width is almost the same in both, viz. 84·8 and 84·9. This depends in both cases on the shortness of the snout, which thus is a retained juvenile characteristic in the Crozet Sea-Elephant, if constant.

If we then turn our attention to the length of the palate, this measurement will be found to vary from 49·5 to 56·5 per cent. of the basal length of the skull in the seven South Georgia male skulls. The figures expressing the same relative dimension in Lydekker's specimens all fall within these limits and have thus no value as racial characteristics.

The width of the palate varies in the South Georgia skulls from 32·2 to 37·1 per cent. of the basal length. Even in this feature Lydekker's specimen from the Crozet Islands is somewhat aberrant as its corresponding percentage amounts to 39·3, thus indicating a very broad palate. In this respect the Crozet specimen does not exhibit a juvenile characteristic, for the corresponding percentages of three quite young males from South Georgia are from 34·5 to 35·7.

Among other characteristics used by Lydekker for distinguishing his races of Sea-Elephants, he mentions the length of the interpalatine suture, which he says is "long" in "*falclandicus*," "shorter" in "*macquariensis*," and "longer" again in "*crosetensis*." It must be said, however, that the shape and size of the palatine bones in the Sea-Elephants are so extremely variable that no value whatever can be laid on any character derived from them. To prove this it may be mentioned that although, as a rule, the palate ends mesially behind in a projecting tip, there are other specimens also adult in which there is quite a deep palatine notch mesially. Not only depending upon this difference but because the bones themselves vary in size, the length of the interpalatine suture becomes very variable, as direct measurements indicate. Thus in the largest of the South Georgia skulls (conf. table of measurements) the interpalatine suture was only 30 mm. but in the next 81, in the next 57, then 62, 44, 61, and 68 mm. respectively. It was thus more than $2\frac{2}{3}$ times longer in the next largest skull than in the largest. The percentages expressing the relation between the basal length of the skull and the length of the interpalatine suture vary from 5·6 to 16·5, and not two of them agree (conf. the table). It is of interest to see that such a great variation in the size of the palatine is not only due to modifications during the growth at a somewhat advanced stage, but that already in quite young individuals a similar difference makes itself apparent to the extent that the length of the interpalatine suture in one of two

equally large quite young individuals is 5.6 per cent. and in the other 10.6 per cent. of the basicranial length (conf. table of measurements).

The shape of the palate should also be different in Lydekker's "subspecies" in such a way that it ought to be "flat behind and hollowed in front" in "*falclandicus*," "markedly hollow throughout" in "*macquariensis*," and "almost flat" in "*crosetensis*." The skulls from South Georgia prove that the degree of "hollowness" is very different in different specimens. In the largest skull, for instance, the palatina are markedly less "hollow" than the maxillary region of the palate, and the lateral portions of the first mentioned bones are very strongly convex. In the second largest skull the whole palate from the posterior border is evenly and strongly vaulted. In the third largest skull the palate is much less "hollow," the palatina are almost flat and somewhat convex laterally. In the fifth largest the palatina are almost flat, but the remainder of the palate is very concave. In the sixth the palate is almost completely flat, and in the seventh it is only a little "hollow." There is thus almost every degree of "hollowness" represented among these seven skulls, and characteristics derived from such a condition cannot be of subspecific value.

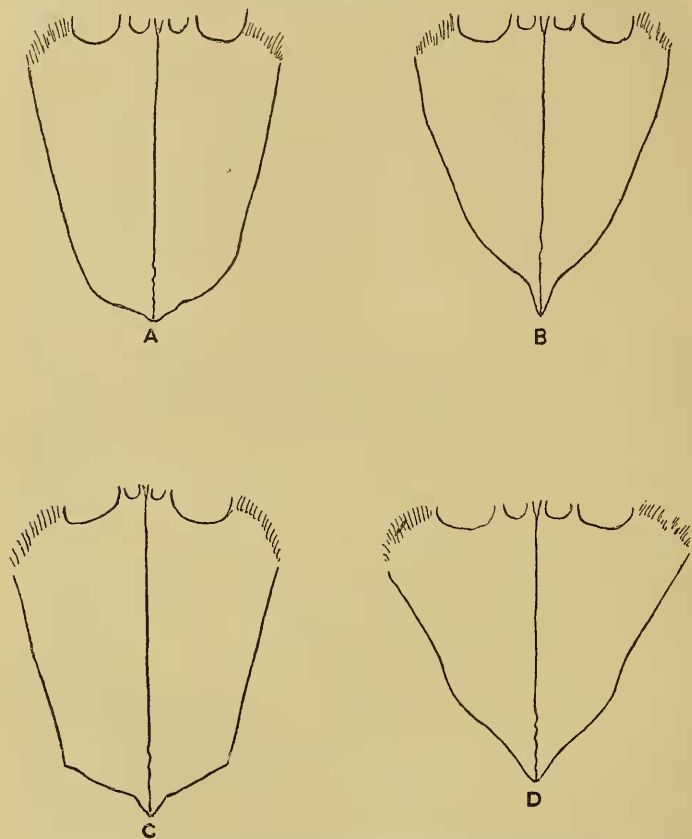
Mr. Lydekker has also used the relative length of the pterygoid processes as a distinguishing characteristic of subspecific value, saying that this process is "small" in "*falclandicus*," "longer" in "*macquariensis*," and "very slender" in "*crosetensis*." Unfortunately, the pterygoid process is subjected to just as great individual variation as other portions of the Sea-Elephant skull. As Lydekker has not recorded any direct measurements with which a comparison can be made, it may be suitable to express its relative length by measuring the distance between its posterior tip and the nearest opposite point on the bulla. This distance measures in the seven skulls from South Georgia respectively 22 mm., 10 mm., 0 mm. (in this skull the pterygoid process forms a complete bridge over to the bulla and is ankylosed with the same), 12 mm., 10 mm., 9 mm., and 4 mm. (the skulls are enumerated in the same order as in the table of measurements). As regards slenderness, the pterygoid process is always compressed and its longest diameter at the tip varies as the following measurements indicate: 10 mm., 13 mm., 15 mm., 19 mm., 15 mm., 12 mm., and 8 mm. The variability of this bone may by this be fully elucidated.

The palatal aspect of the premaxillaries is said to be V-shaped in "*falclandicus*" and "*macquariensis*," but U-shaped in "*crosetensis*." The present material from South Georgia proves that this characteristic is just as variable as the others. In the fifth and sixth of these seven skulls the V-shape of the palatal aspect of the premaxillaries is quite typical, but in the second and third the U-shape is just as pronounced as in Lydekker's figure of "*crosetensis*"; the others show intermediate features.

The accompanying figures (text-fig. 55, A-D) show this different shape of the premaxillaries in the Sea-Elephant from South

Georgia. The length of the palatine surface of the premaxillaries varies without correspondence to age or size from 19·7 to 25·7 per cent. of the basal length of the skull (conf. table of measurements).

Text-fig. 55.



Outline of palatal aspect of premaxillaries of four specimens of the Sea-Elephant from South Georgia.

Having thus examined and tried on the Sea-Elephant skulls from South Georgia all the characteristics which Lydekker regarded as satisfactory and distinctive, I have come to the conclusion that all of them are extremely variable, and, with the exception of two characteristics of "*crosetensis*," to which I shall return presently, and the width of the occipital condyles, which also will be spoken about later on, all the characteristics of Lydekker's presumed subspecies are to be found within the limits of the variation of the South Georgia Sea-Elephant. But this

animal must for geographical reasons be just the one which Lydekker has named "*falclandicus*," which thus in itself unites most of the characteristics of all the others. The Sea-Elephants have long ago been exterminated on the Falkland Islands, and if now and then at the present time such an animal should be found there, it is a straying individual which has come there accidentally, most probably from South Georgia—an analogy to the fact that sometimes, although seldom, a Walrus appears at the Norwegian coast, in spite of the fact that the Walrus is as little pelagic in its habits as the Sea-Elephant.

The Sea-Elephant of the Crozet Islands Lydekker with some hesitation regards as identical with those inhabiting Kerguelen and Heard Islands. From a geographical point of view such an assumption appears quite probable. If, however, this assumption is accepted there is some material for the further consideration of the "*crozetensis*" form available in the literature, because Turner has, in his report on the Seals in the Scientific Results of the Voyage of H.M.S. 'Challenger,'* communicated a table of measurements of Sea-Elephant skulls, and among them are two male specimens from Heard Island and one male from Kerguelen Island. The lengths of the Heard Island skulls from premaxillary to occipital condyle are respectively 493 and 486 mm., and the same measurement of the Kerguelen skull is 402 mm. As the condyle has been included in these measurements the figures quoted are not directly comparable with those of the accompanying table, but by comparing the corresponding measurements of skulls at hand with the basal lengths of the same, it is easy to reckon how great a reduction is necessary to obtain the approximate basal lengths of Turner's skulls. It cannot be many millimetres wrong to assume the basal length of the Heard Island skulls to be 470 and 464 mm. respectively and that of the Kerguelen skull to be 380 mm. The measurements expressing the zygomatic width and the greatest width of the palate of these skulls are also recorded in Turner's table. If, then, the relations between these measurements and the basal length are reckoned in percentages of the latter, the following figures are obtained :—

| | Heard Island, Kerguelen. | | |
|---|--------------------------|------|------|
| Zygomatic width in percent. of basal length | 74.4 | 76.2 | 73.9 |
| Greatest width of palate in percent. of | } | } | } |
| basal length | | | |
| | 32.7 | 38.3 | 32.6 |

The three former percentages fall all of them quite well within the limits of variation found in the South Georgia skulls as quoted above; and if these specimens belong to the "*crozetensis*" form, the zygomatic width of the same is only in exceptional cases, as in Lydekker's specimen referred to above, greater than in South Georgia specimens, i. e. "*falclandicus*." The zygomatic width is consequently no distinguishing characteristic between these two.

Of the percentages expressing the relation of the width of the palate, the first and the last are rather low even for South Georgia

* Zoology, vol. xxvi. p. 6.

specimens. The middle one again (38.3) is about one per cent. higher than the highest of the corresponding dimension of South Georgia specimens. From this fact and that recorded above from Lydekker's Crozet specimen only one conclusion can be drawn, that *sometimes* the Sea-Elephants of the Crozet-Kerguelen-Heard Islands geographic group have a greater palatal width than their relatives in other places so far as is known. It is not, however, a general rule and thus no distinguishing characteristic.

With regard to other measurements also, the relative dimensions of the skulls from Kerguelen and Heard Islands measured by Turner vary within the same limits as the corresponding figures of South Georgia skulls. As an example may be mentioned that the width of the skull at the posterior edges of *meatus auditorius externus* is in the South Georgia skulls from 61.9 to 68.4 per cent. of the basal length (conf. table of measurements), while the corresponding measurements of Turner's skulls are respectively 64.4, 61.2, and 66.8. These latter measurements do not indicate any greater width of the skull than the corresponding figures of South Georgia skulls.

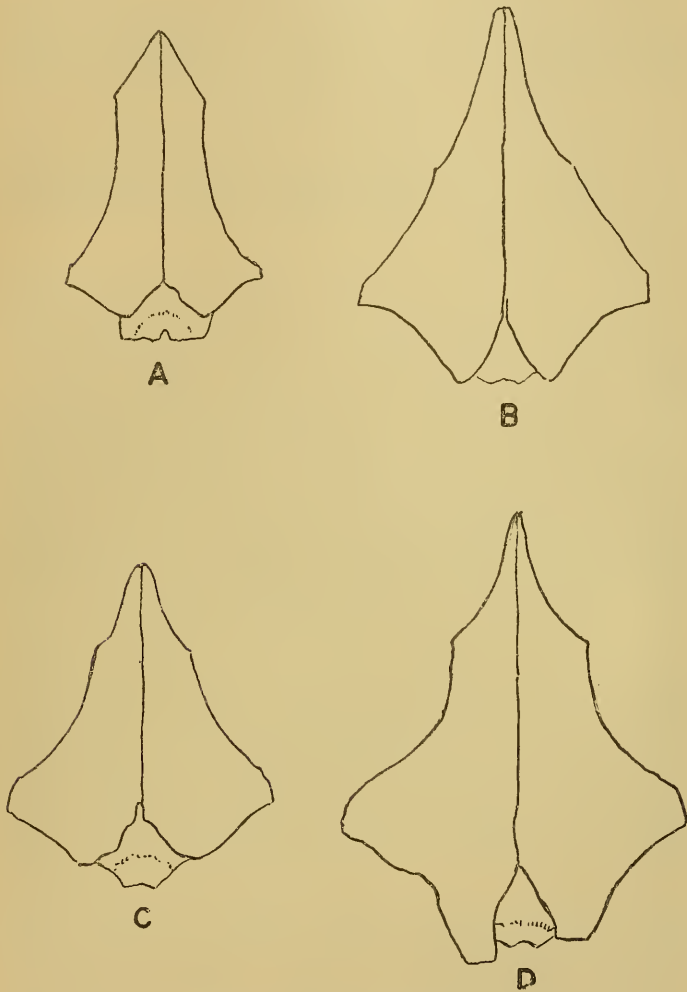
Another example indicating a similar condition is obtained by comparing the width of the maxillary portion of the skull with the basal length. In this case I have measured the South Georgia skulls on a level with the upper posterior premaxillary suture. The percentages expressing this relation (conf. table of measurements) vary in the adult and semiadult males from 30.9 to 38.3 per cent., without corresponding with the size or age of the animals. With the above measurements may correspond fairly well those recorded by Turner as indicating the "width of maxilla across middle of rostrum" of Heard Island and Kerguelen specimens. If these then are compared with the basal length of the skulls (conf. above), the following percentages are obtained (enumerated in the same order as before): 34.0, 36.4, and 32.1. All these fall evidently within the limits of variation of the South Georgia material, and they do not at all indicate any greater relative width of this portion of the skull in the Heard-Kerguelen animals than in those from South Georgia.

In Turner's table of measurements there are some figures indicating the "smallest interfrontal width." As I do not know whether this measurement coincides with the least frontal width according to my way of measuring, I cannot make any direct comparison, but only quote the percentages obtained. In the South Georgia material there is a variation from 15.0 to 20.5, but the percentages reckoned from Turner's figures are respectively 15.1, 14.0, and 13.6, thus lower than the former. If Turner's and my own measurements really coincide, as I believe they do, the percentages appear to indicate a narrower forehead in the Heard-Kerguelen Sea-Elephants.

The measurements hitherto considered show very plainly a quite irregular variation which does not correspond with size or age. But there is another relative dimension which exhibits a very

beautiful series (conf. the table of measurements) in full correspondence with the size of the skull, and that is the width of the occipital condyles compared with the basal length of the skull.

Text-fig. 56.



Outline of the nasals of four specimens of the Sea-Elephant from South Georgia.

This percentage decreases regularly and gradually from the skull of the quite young animal to that of the oldest bull. Considering this fact, it is perhaps of importance that Lydekker states that the

condyles of his "*crozetensis*" are "extremely narrow." To judge from his figure (*l. c.* p. 605) the condyles of the Crozet skull appear to be only about 20 per cent. of the basal length of the skull, although the latter measurement is said to be "16.5 ins." or 412 mm. According to the condition observed in the material from South Georgia, the condyles of such a small skull ought to have been something about 28 per cent. of the basal length. It is possible that this characteristic together with others—but hardly those discussed above—might prove that a racial difference exists in the geographic group represented by the Crozet skull. It is, however, difficult to base any opinion about this on a single skull when these animals have proved so extremely variable in their skull characters. Unfortunately, Turner has not communicated any measurements of the condyles of his skulls from Heard Island and Kerguelen Island.

The Sea-Elephant skulls from South Georgia show a quite irregular variation in many other respects than those already mentioned. The general shape of the nasals is, for instance, very variable as the accompanying four figures (text-fig. 56 A-D, p. 587) prove. The dimensions are also extremely different in different specimens with regard to length as well as to width, as may be seen from the table of measurements. The mesethmoid reaches the upper surface of the skull and fills up the mesial anterior notch between the nasals, where it expands more or less in different specimens as the figures of the nasals show. By this a continued growth forward and ossification of the nasals in the mesial line is made impossible, but on either side of the mesethmoid there is free space enough for such a growth and this might contribute to the irregular shape of the nasals.

The exceedingly great variation of the Sea-Elephant skulls appears to be fully proved by these notes, and it must certainly be regarded as a very interesting fact. This great variation is partly explained by the general rule that large mammals, the growth of which is continued through a long period of years, each of which contains different seasons with different conditions of life, are more apt to vary than such as conclude their growth within one year. Another factor which also may be of some importance in this connection is that the Sea-Elephants originally had hardly any dangerous foes which could influence a natural selection. Now, however, these very interesting and completely harmless sea-monsters have been unfortunate enough to provoke the most dangerous of all foes—the greediness of man; and by this they are threatened with extinction even in the few remote places where they may still exist in limited numbers. Indeed, the Southern Sea-Elephant is doomed to share the sad fate of its Californian relative if speedy measures are not taken for its protection. The hope of zoologists and all friends of living nature is that the Government of Great Britain may give this protection which is so sorely needed.

ABSTRACT OF THE PROCEEDINGS
OF THE
ZOOLOGICAL SOCIETY OF LONDON.*

March 1st, 1910.

Dr. A. SMITH WOODWARD, F.R.S., Vice-President,
in the Chair.

The Minutes of the last Scientific Meeting were confirmed.

The SECRETARY exhibited photographs of a Thylacine (*Thylacinus cynocephalus*) and three cubs which had been sent him by Mrs. Mary G. Roberts, C.M.Z.S., of Hobart, Tasmania. Mrs. Roberts had informed him by letter that the Thylacines had been in her possession for about eight months, and were tame and playful, and that the mother had nursed them until they were nearly as large as herself, although throughout that time they had also taken raw meat. Mrs. Roberts added that the Thylacine had extremely strong maternal instincts and that these animals, in her opinion, were not of low intelligence.

The SECRETARY called attention to the recently published 'Camera Adventures in the African Wilds,' by A. Radclyffe Dugmore, remarking on the great additions to knowledge of wild animals that were being obtained by this new form of sport. He directed special attention to the photographs of Grévy's Zebra, obtained near the Guaso Nyiro River, not far from Mt. Kenia, as evidence of the range of that species, and to an extremely interesting photograph of the Giant Bush-Pig (*Hylochoerus meinertzhageni*) taken in the same locality.

Mr. R. H. BURNE, F.Z.S., exhibited a preparation of the vena cava inferior, diaphragm, and liver from a Seal (*Phoca vitulina*) that had recently been living in the Gardens. The specimen

* This Abstract is published by the Society at 3 Hanover Square, London, W., on the Tuesday following the date of Meeting to which it refers. It will be issued, along with the 'Proceedings,' free of extra charge, to all Fellows who subscribe to the Publications; but it may be obtained on the day of publication at the price of *Sixpence*, or, if desired, sent post-free for the sum of *Six Shillings* per annum, payable in advance.